

**IN THE UNITED STATES DISTRICT COURT
FOR THE EASTERN DISTRICT OF TEXAS
MARSHALL DIVISION**

**ERICSSON INC., AND
TELEFONAKTIEBOLAGET LM ERICSSON**

Plaintiff,

vs.

**SAMSUNG ELECTRONICS CO., LTD., AND
SAMSUNG ELECTRONICS AMERICA, INC.,**

Defendants.

Civil Action No. 2:21-cv-10

JURY TRIAL

ORIGINAL COMPLAINT FOR PATENT INFRINGEMENT

Plaintiffs Ericsson Inc. and Telefonaktiebolaget LM Ericsson (collectively, “Ericsson”) file this Original Complaint for Patent Infringement against Samsung Electronics Co., Ltd. and Samsung Electronics America, Inc. (collectively, “Samsung”), and allege as follows:

THE PARTIES

1. Plaintiff Ericsson Inc. is a Delaware corporation with its principal place of business at 6300 Legacy Drive, Plano, Texas 75024.

2. Plaintiff Telefonaktiebolaget LM Ericsson is a corporation organized under the laws of the Kingdom of Sweden with its principal place of business at Torshamnsgatan 21, Kista, 164 83, Stockholm, Sweden.

3. Ericsson owns a valuable portfolio of patents that are globally used in cellular network infrastructure equipment, cellular handsets, smartphones, tablet computers, televisions, and many other electrical devices.

4. Defendant Samsung Electronics Co., Ltd. (“SEC”) is a Korean company with its principal place of business in Suwon, South Korea. SEC has an “Information Technology & Mobile Communications” division that is responsible for the design, manufacture, and sale of cellular network infrastructure equipment and components thereof around the world and in the United States.

5. Defendant Samsung Electronics America, Inc. (“SEA”) is a New York corporation with its principal place of business in Ridgefield Park, New Jersey, and it is a wholly-owned subsidiary of SEC. SEA imports into the United States and sells in the United States, including in this District, cellular network infrastructure equipment and components thereof.

JURISDICTION AND VENUE

6. This is an action arising under the patent laws of the United States, 35 U.S.C. § 271. This Court has subject matter jurisdiction under 28 U.S.C. §§ 1331 and 1338(a).

7. Venue is proper in this judicial district under 28 U.S.C. §§ 1391 and 1400(b).

8. This Court has personal jurisdiction over Defendant Samsung. Samsung has continuous and systematic business contacts with the State of Texas. Samsung, directly or through subsidiaries or intermediaries (including distributors, retailers, and others), has negotiated with Ericsson in this District and also conducts its business extensively throughout Texas, by shipping, distributing, offering for sale, selling, and advertising (including the provision of an interactive web page) its products and/or services in the State of Texas and the Eastern District of Texas. SEA, SEC’s wholly-owned subsidiary, maintains an office in Plano, Texas and is responsible for importing and selling smartphones, tablets, other mobile devices, and cellular network infrastructure equipment that operate on cellular networks in the United States. SEC and SEA

regularly do business or solicit business, engage in other persistent courses of conduct, and/or derive substantial revenue from products and/or services provided to individuals in the State of Texas.

9. SEC and SEA, directly and through subsidiaries or intermediaries (including distributors, retailers, and others), have purposefully and voluntarily placed one or more products and/or services in the stream of commerce that practice the Asserted Patents with the intention and expectation that they will be purchased and used by consumers in the Eastern District of Texas. These products and/or services have been and continue to be purchased and used by operators/carriers in the Eastern District of Texas.

10. Upon information and belief, the Samsung products accused of infringement in this case are manufactured by or on behalf of SEC and SEA.

11. Ericsson Inc. is a corporation with its principal place of business in the Eastern District of Texas. Ericsson Inc. is a wholly-owned subsidiary of LME and is responsible, among other things, for importing and selling cellular network infrastructure equipment to cellular carriers in the United States.

THE ASSERTED PATENTS

12. U.S. Patent No. 8,301,149, entitled “Call Quality and Coverage Improvement in Mobile Wireless Communication Networks,” was duly and legally issued to inventors Juan Carlos del Rio Romero, Juan Jose Guerrero Garcia, and Juan Ramiro Moreno on October 30, 2012. Ericsson owns by assignment the entire right, title, and interest in the ’149 patent and is entitled to sue for past and future infringement.

13. U.S. Patent No. 9,037,166, entitled “Apparatus and Method for Scheduling Paging Messages in a Communications Network,” was duly and legally issued to inventors Erik De Wit and Bengt Persson on May 19, 2015. Ericsson owns by assignment the entire right, title, and interest in the ’166 patent and is entitled to sue for past and future infringement.

14. U.S. Patent No. 9,107,082, entitled “Array Antenna Arrangement,” was duly and legally issued to inventors Mats H. Andersson, Martin Johansson, Bo Goransson, Ulrika Engstrom, Anders Derneryd, and Sven Petersson on August 11, 2015. Ericsson owns by assignment the entire right, title, and interest in the ’082 patent and is entitled to sue for past and future infringement.

15. U.S. Patent No. 9,509,605, entitled “Methods and Apparatuses for Handling Communication in a Communication System Comprising an Access Point and a Wire Line Network Node Connected Via Wire Line to the Access Point,” was duly and legally issued to inventors Kim Laraqui, Henrik Almeida, Per-Erik Eriksson, and Chenguang Lu on November 29, 2016. Ericsson owns by assignment the entire right, title, and interest in the ’605 patent and is entitled to sue for past and future infringement.

16. U.S. Patent No. 9,692,682, entitled “Methods and Network Nodes for Handling Handover Failures,” was duly and legally issued to inventors Badawi Yamine and Johan Moe on June 27, 2017. Ericsson owns by assignment the entire right, title, and interest in the ’682 patent and is entitled to sue for past and future infringement.

17. U.S. Patent No. 10,172,066, entitled “Flexible Bearer Handling,” was duly and legally issued to inventors Kim Laraqui, Ioanna Pappa, and Tomas Thyni on January 1, 2019. Ericsson owns by assignment the entire right, title, and interest in the ’066 patent and is entitled to sue for past and future infringement.

Count I: Claim for Patent Infringement of the '149 Patent

18. Ericsson repeats and realleges the allegations in paragraphs 1-17 as if fully set forth herein.

19. Samsung has infringed, contributed to the infringement of, and/or induced infringement of the '149 patent by making, using, selling, offering for sale, or importing into the United States, or by intending that others make, use, import into, offer for sale, or sell in the United States, products and/or methods covered by one or more claims of the '149 Patent including, but not limited to, cellular network infrastructure equipment and components thereof. The accused network equipment that infringes one or more claims of the '149 patent includes at least the Samsung eNB (LTE).

20. For example, at least the Samsung eNB (LTE) infringes at least claims 1, 8, and 13 of the '149 patent. Samsung makes, uses, sells, offers for sale, imports, exports, supplies or distributes within the United States this network equipment and thus directly infringes the '149 patent.

21. Samsung indirectly infringes the '149 patent as provided by 35 U.S.C. § 271(b) by inducing infringement by others, such as resellers and end-user customers in this District and throughout the United States. For example, direct infringement is the result of activities performed by manufacturers, resellers, or operators/carriers of the Samsung eNB (LTE), who perform each step of the claimed invention as directed by Samsung. Samsung received actual notice of the '149 patent at least as early as the filing of this Complaint.

22. Samsung's affirmative acts of selling the Samsung eNB (LTE), causing the Samsung eNB (LTE) to be manufactured, and providing directions, instructions, schematics,

diagrams, or designs to its manufacturers, resellers, or operators/carriers to make or use the Samsung eNB (LTE) in a manner that directly infringes the '149 patent induce infringement by others, such as resellers or operators/carriers in this District and throughout the United States. Through its manufacture and sales of the Samsung eNB (LTE), Samsung performed the acts that constitute induced infringement with knowledge or willful blindness that the induced acts would constitute infringement.

23. Samsung also indirectly infringes the '149 patent by contributing to infringement by others, such as resellers and operators/carriers, in accordance with 35 U.S.C. § 271(c) in this District and throughout the United States. Direct infringement is the result of activities performed by resellers, or operators/carriers of the Samsung eNB (LTE).

24. Samsung's affirmative acts of selling the Samsung eNB (LTE) and causing the Samsung eNB (LTE) to be manufactured and sold contribute to Samsung's manufacturers, resellers, and operators/carriers making or using the Samsung eNB (LTE) in a normal and customary way that infringes the '149 patent. The Samsung eNB (LTE) constitutes the material part of Ericsson's patented invention, has no substantial non-infringing uses, and is known by Samsung to be especially made or especially adapted for use to infringe the '149 patent.

25. The Samsung eNB (LTE) includes an Antenna Tilt Optimization (Coverage and Capacity Optimization) feature, which provides a method for improving coverage within a mobile wireless communications network, as demonstrated in the exemplar text below:

LTE-S02031, Antenna Tilt Optimization (Coverage and Capacity Optimization)

INTRODUCTION

The Antenna Tilt Optimization (ATO) Coverage and Capacity Optimization (CCO) as LTE network optimization during the operation consists of a function of monitoring the network change and calculating the optimized tilt value after detecting the change in the network. These functions work at the configurable interval.

26. The Samsung eNB (LTE) includes Antenna Tilt Optimization (Coverage and Capacity Optimization) feature that provides one or more rules related to coverage in the wireless communications network, as demonstrated in the exemplar text below:

The detailed functions of the ATO CCO without MDT information are as follows:

- Monitoring change in air interface
 - Calculating the change index parameter based on collected information
 - ◆UE count
 - ◆Outage ratio :radio link failure probability
 - ◆Signal to Noise Ratio (SNR)
 - ◆NbrINR : Interference to noise ratio working to the neighbor cell as interference component
 - Determining the occurrence of the air interface change to the specific index conditions
- E-tilt optimization
 - Monitoring the change of the air interface, deciding e-tilt difference fit for following conditions to the target cell:

27. The Samsung eNB (LTE) includes Antenna Tilt Optimization (Coverage and Capacity Optimization) feature that collects key performance indicators from the wireless communications network, the key performance indicators comprising data indicating a count of events triggered by at least one of an uplink quality falling below a threshold or a maximum allowed downlink power state, and compares the amount of failed handovers to a failure threshold, as demonstrated in the exemplar text below:

Counters and KPIs**ATO CCO without MDT Information**

Counters related with Smart SON ATO CCO function without MDT information

Family Display Name	Type Name	Type Description
RRC connection establishments	ConnEstabSucc	The number of RRC connection setup success
RRC Connection Re-establishment	ConnReEstabSucc	The number of RRC reestablishment success
Call Drop	CallDrop_ECCB_RADIO_LINK_FAILURE	The number of call released due to radio link failure

28. The Samsung eNB (LTE) includes Antenna Tilt Optimization (Coverage and Capacity Optimization) feature that correlates the key performance indicators with the one or more rules relating to adjusting at least one of a pilot power or an antenna tilt, as demonstrated in the exemplar text below:

5 Collecting information

- The Smart SON Server collects serving/neighbor cell SRS information from the Smart Scheduler during TPeriod.
- The Smart SON Server collects the information on periodic MR (optional) and PM statistics from eNBs during TPeriod.
- ◆Interface for statistic information collecting: FTP

6 Operating the function of monitoring change in air interface

- Calculate the detection parameter by using (5) information.
- Determine change in the network by using the detection parameter.
- If change in the network does not occur, the SSOM alarms the end of the ATO CCO operation/Operate from (10).
- Select the cell in the network change to the target to change tilt.

29. The Samsung eNB (LTE) includes Antenna Tilt Optimization (Coverage and Capacity Optimization) feature that generates adjustments to one or more parameters within the wireless communications network in response to the key performance indicators correlating to the one or more rules, as demonstrated in the exemplar text below:

7 Determining the change in e-tilt

- o Calculate the tilt optimization parameter by using (5) information.
- o Determine e-tilt change by using the tilt optimization parameter for the selected cell.
- o Determine effectiveness and rollback of the changed e-tilt at the past interval.
- o If change in the e-tilt does not occur, the SSOM alarms the end of the ATO CCO operation/Operate from (10).

30. The Samsung eNB (LTE) includes Antenna Tilt Optimization (Coverage and Capacity Optimization) feature that applies the generated adjustments to the wireless communications network, as demonstrated in the exemplar text below:

8 Alarming change in e-tilt

- o The Smart SON server delivers the changed e-tilt to SSOM.
- o The SSOM transmits the change e-tilt to EMS.
- o The EMS transmits the changed e-tilt to eNB for apply the changed e-tilt value to the RET. (E-tilt values of multi RET in eNB are applied in parallel.)

Count II: Claim for Patent Infringement of the '166 Patent

31. Ericsson repeats and realleges the allegations in paragraphs 1-30 as if fully set forth herein.

32. Samsung has infringed, contributed to the infringement of, and/or induced infringement of the '166 patent by making, using, selling, offering for sale, or importing into the United States, or by intending that others make, use, import into, offer for sale, or sell in the United States, products and/or methods covered by one or more claims of the '166 Patent including, but not limited to, cellular network infrastructure equipment and components thereof. The accused network equipment that infringes one or more claims of the '166 patent includes at least the Samsung eNB (LTE).

33. For example, at least the Samsung eNB (LTE) infringes at least claims 5 and 13 of the '166 patent. Samsung makes, uses, sells, offers for sale, imports, exports, supplies or distributes within the United States this network equipment and thus directly infringes the '166 patent.

34. Samsung indirectly infringes the '166 patent as provided by 35 U.S.C. § 271(b) by inducing infringement by others, such as resellers and end-user customers in this District and throughout the United States. For example, direct infringement is the result of activities performed by manufacturers, resellers, or operators/carriers of the Samsung eNB (LTE), who perform each step of the claimed invention as directed by Samsung. Samsung received actual notice of the '166 patent at least as early as the filing of this Complaint.

35. Samsung's affirmative acts of selling the Samsung eNB (LTE), causing the Samsung eNB (LTE) to be manufactured, and providing directions, instructions, schematics, diagrams, or designs to its manufacturers, resellers, or operators/carriers to make or use the Samsung eNB (LTE) in a manner that directly infringes the '166 patent induce infringement by others, such as resellers or operators/carriers in this District and throughout the United States. Through its manufacture and sales of the Samsung eNB (LTE), Samsung performed the acts that constitute induced infringement with knowledge or willful blindness that the induced acts would constitute infringement.

36. Samsung also indirectly infringes the '166 patent by contributing to infringement by others, such as resellers and operators/carriers, in accordance with 35 U.S.C. § 271(c) in this District and throughout the United States. Direct infringement is the result of activities performed by resellers, or operators/carriers of the Samsung eNB (LTE).

37. Samsung's affirmative acts of selling the Samsung eNB (LTE) and causing the Samsung eNB (LTE) to be manufactured and sold contribute to Samsung's manufacturers, resellers, and operators/carriers making or using the Samsung eNB (LTE) in a normal and customary way that infringes the '166 patent. The Samsung eNB (LTE) constitutes the material part of Ericsson's patented invention, has no substantial non-infringing uses, and is known by Samsung to be especially made or especially adapted for use to infringe the '166 patent.

38. The Samsung eNB (LTE) includes a Multimedia Priority Service, which provides a method of scheduling paging messages in a communications network, as demonstrated in the exemplar text below:

Chapter 9 Services

LTE-SV0105, eMPS (Enhancements for Multimedia Priority Service) Support

INTRODUCTION

The Multimedia Priority Service (MPS) is introduced for supporting end-to-end priority treatment in call/session origination/termination. Enhancements for MPS include admission control and pre-emption for high priority calls and CSFB high priority call handling.

39. The Samsung eNB (LTE) includes a Multimedia Priority Service that (i) receives, at a network element, a request to schedule a new paging message, (ii) compares, by the network element, a priority level of the new paging message with a priority level of paging messages already stored in a scheduling queue; (iii) in the event that one or more paging messages with a lower priority level are found to be stored in the scheduling queue, replacing, by the network element, one or more of the lower priority level paging messages with the new paging message, (iv) wherein the comparing and the replacing are performed only after first determining that there

are insufficient spaces available in the scheduling queue for storing the new paging message, as demonstrated in the exemplar text below:

FEATURE DESCRIPTION

This feature is introduced to provide a subscriber priority access to the system resources during congestion state. It includes three functions: paging priority, high-priority access, and preemption.

UE requests a RRC connection with highPriorityAccess, and eNB processes this call with the same high priority as an emergency call. If the resource is not available, eNB preempts an existing call to accept the high priority call.

For UE terminated call, eNB provides the paging priority. In congestion state, eNB can receive a huge number of paging messages from MME. If a paging message is marked as a priority, eNB puts this message in front of the normal paging messages in the list. So, the message can be broadcasted in the very next paging occasion.

eNB supports two level of paging priority: high or normal. For CSFB priority call handling, this paging priority must be supported.

During E-RAB setup procedures, a high-priority ARP bearer can preempt an existing low-priority bearer in congestion.

Count III: Claim for Patent Infringement of the '082 Patent

40. Ericsson repeats and realleges the allegations in paragraphs 1-39 as if fully set forth herein.

41. Samsung has infringed, contributed to the infringement of, and/or induced infringement of the '082 patent by making, using, selling, offering for sale, or importing into the United States, or by intending that others make, use, import into, offer for sale, or sell in the United States, products and/or methods covered by one or more claims of the '082 Patent including, but not limited to, cellular network infrastructure equipment and components thereof. The accused network equipment that infringes one or more claims of the '082 patent includes at least the Samsung 5G Access Unit (including, but not limited to, Samsung's SFG-AA100AC and/or AT1K0 network components) and the Samsung Massive MIMO Units for 5G and LTE (including,

but not limited to, Samsung's MTP02P-41A (5G), MTP02P-41A (LTE), and MT6402-48A) (collectively, the "'082 Accused Products").

42. For example, at least the '082 Accused Products infringe at least claims 1, 11 and 16 of the '082 patent. Samsung makes, uses, sells, offers for sale, imports, exports, supplies or distributes within the United States this network equipment and thus directly infringes the '082 patent.

43. Samsung indirectly infringes the '082 patent as provided by 35 U.S.C. § 271(b) by inducing infringement by others, such as resellers and end-user customers in this District and throughout the United States. For example, direct infringement is the result of activities performed by manufacturers, resellers, or operators/carriers of the '082 Accused Products, who perform each step of the claimed invention as directed by Samsung. Samsung received actual notice of the '082 patent at least as early as the filing of this Complaint.

44. Samsung's affirmative acts of selling the '082 Accused Products, causing them to be manufactured, and providing directions, instructions, schematics, diagrams, or designs to its manufacturers, resellers, or operators/carriers to make or use the '082 Accused Products in a manner that directly infringes the '082 patent induce infringement by others, such as resellers or operators/carriers in this District and throughout the United States. Through its manufacture and sales of the '082 Accused Products, Samsung performed the acts that constitute induced infringement with knowledge or willful blindness that the induced acts would constitute infringement.

45. Samsung also indirectly infringes the '082 patent by contributing to infringement by others, such as resellers and operators/carriers, in accordance with 35 U.S.C. § 271(c) in this

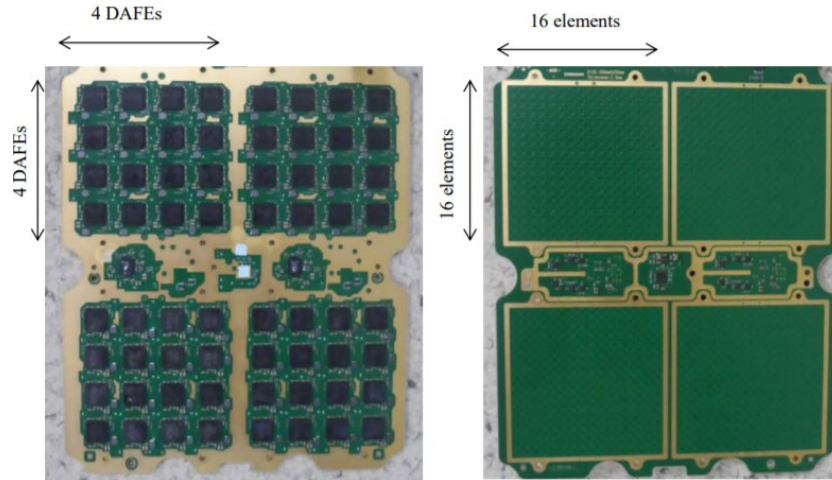
District and throughout the United States. Direct infringement is the result of activities performed by resellers, or operators/carriers of the '082 Accused Products.

46. Samsung's affirmative acts of selling the '082 Accused Products and causing them to be manufactured and sold contribute to Samsung's manufacturers, resellers, and operators/carriers making or using the '082 Accused Products in a normal and customary way that infringes the '082 patent. The '082 Accused Products constitute the material part of Ericsson's patented invention, has no substantial non-infringing uses, and is known by Samsung to be especially made or especially adapted for use to infringe the '082 patent.

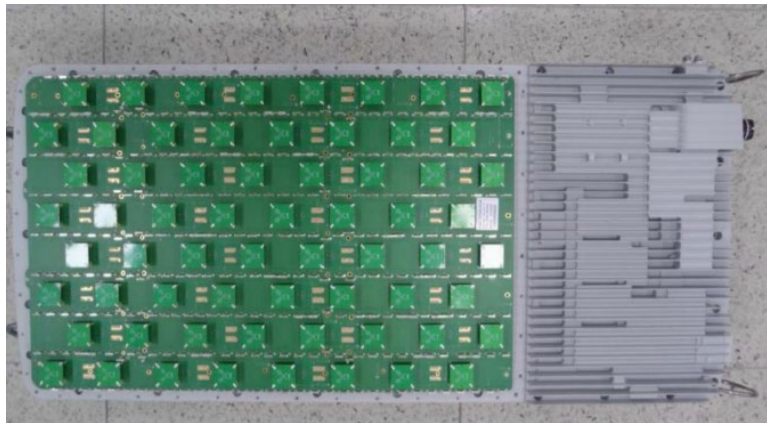
47. The '082 Accused Products provide a wireless communication system, comprising at least one base station in a communication cell.

48. The '082 Accused Products include a base station being equipped with at least one array antenna comprising at least four antenna ports. The '082 Accused Products include at least one array antenna with either four, thirty-two, or sixty-four antenna ports.

49. The '082 Accused Products further provide that the at least four ports are connected to respective at least four corresponding antenna elements arranged in at least two rows and at least two columns, as demonstrated in the exemplar images below:



5G Access Unit



Massive MIMO Units

50. The '082 Accused Products further provide that the array antenna is arranged for communication via at least two antenna radiation lobes, each antenna radiation lobe communicating an information stream to at least one user equipment (UE) in the cell, thus communicating by means of Multiple Input Multiple Output (MIMO), as demonstrated in the exemplar images below:



5G Access Unit

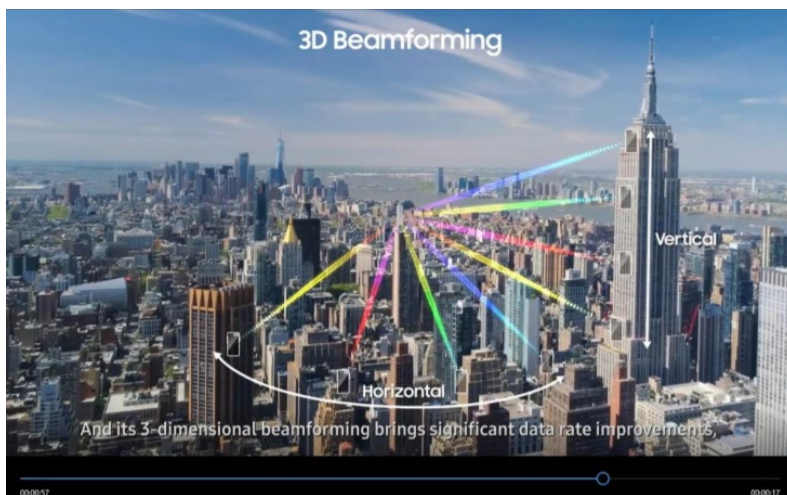


Massive MIMO Units

51. The '082 Accused Products further provide that each antenna radiation lobe is individually controllable both in azimuth and elevation whereby the communication of the information streams is optimized, and wherein a total information stream is fed into the communication system, and independent of how many antenna radiation lobes are used all information from said total information stream is always radiated by the at least four antenna elements, as demonstrated in the exemplar images below:



5G Access Unit



Massive MIMO Units

Count IV: Claim for Patent Infringement of the '605 Patent

52. Ericsson repeats and realleges the allegations in paragraphs 1-51 as if fully set forth herein.

53. Samsung has infringed, contributed to the infringement of, and/or induced infringement of the '605 patent by making, using, selling, offering for sale, or importing into the United States, or by intending that others make, use, import into, offer for sale, or sell in the United

States, products and/or methods covered by one or more claims of the '605 Patent including, but not limited to, cellular network infrastructure equipment and components thereof. The accused network equipment that infringes one or more claims of the '605 patent includes at least the Samsung 5G Access Unit (including, but not limited to, Samsung's SFG-AA100 and/or AT1K01 network components) and Samsung virtualized Radio Access Network ("vRAN") ("including, but not limited to, virtualized Central Unit ("vCU") and virtualized Distributed Unit ("vDU")).

54. For example, at least the Samsung 5G Access Unit and/or vRAN infringes at least claims 1, 7, 10, 14, 17, and 18 of the '605 patent. Samsung makes, uses, sells, offers for sale, imports, exports, supplies or distributes within the United States this network equipment and thus directly infringes the '605 patent.

55. Samsung indirectly infringes the '605 patent as provided by 35 U.S.C. § 271(b) by inducing infringement by others, such as resellers and end-user customers in this District and throughout the United States. For example, direct infringement is the result of activities performed by manufacturers, resellers, or operators/carriers of the Samsung 5G Access Unit and/or vRAN, who perform each step of the claimed invention as directed by Samsung. Samsung received actual notice of the '605 patent at least as early as the filing of this Complaint.

56. Samsung's affirmative acts of selling the Samsung 5G Access Unit and/or vRAN, causing the 5G Access Unit and/or vRAN to be manufactured, and providing directions, instructions, schematics, diagrams, or designs to its manufacturers, resellers, or operators/carriers to make or use the 5G Access Unit and/or vRAN in a manner that directly infringes the '605 patent induce infringement by others, such as resellers or operators/carriers in this District and throughout the United States. Through its manufacture and sales of the Samsung 5G Access Unit and/or

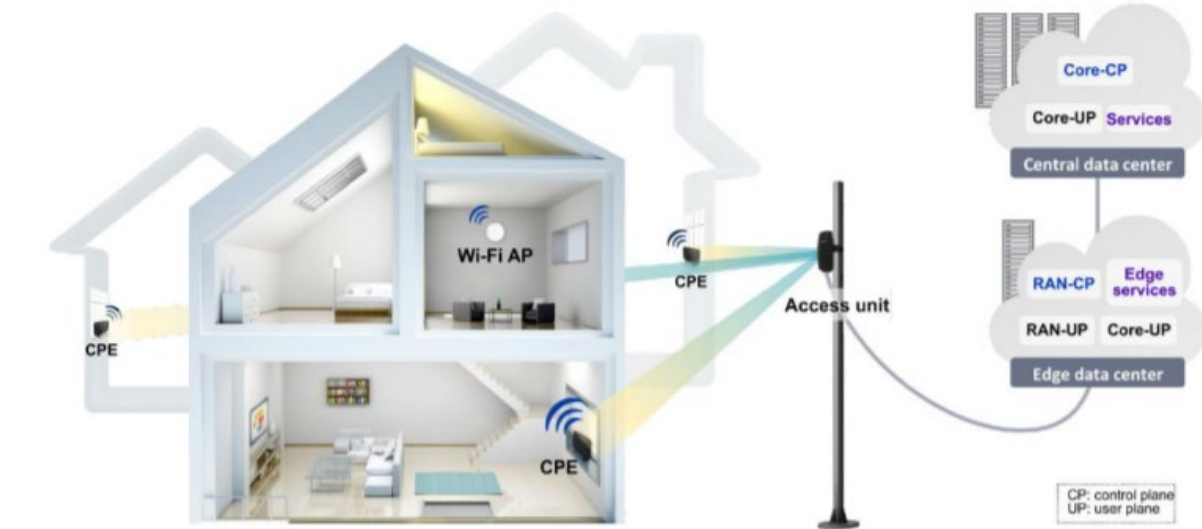
vRAN, Samsung performed the acts that constitute induced infringement with knowledge or willful blindness that the induced acts would constitute infringement.

57. Samsung also indirectly infringes the '605 patent by contributing to infringement by others, such as resellers and operators/carriers, in accordance with 35 U.S.C. § 271(c) in this District and throughout the United States. Direct infringement is the result of activities performed by resellers, or operators/carriers of the Samsung 5G Access Unit and/or vRAN.

58. Samsung's affirmative acts of selling the Samsung 5G Access Unit and/or vRAN and causing it to be manufactured and sold contribute to Samsung's manufacturers, resellers, and operators/carriers making or using the 5G Access Unit and/or vRAN in a normal and customary way that infringes the '605 patent. The Samsung 5G Access Unit and/or vRAN constitutes the material part of Ericsson's patented invention, has no substantial non-infringing uses, and is known by Samsung to be especially made or especially adapted for use to infringe the '605 patent.

59. The Samsung 5G Access Unit includes an access point, operative as a Residential Small Cell (RSC)-access point, to handle uplink communication in a communication system comprising the access point and a wire line network node connected via wire line to the access point. The Samsung 5G Access Unit is connected via a wireline connection to a vRAN (e.g., in a Samsung edge data center) and provides bidirectional Fixed Wireless Access (FWA) to Customer Premises Equipment (CPE), as demonstrated in the exemplar image below:

Figure 4: Samsung's end-to-end 5G FWA network



Source: Samsung

60. Upon information and belief, the Samsung 5G Access Unit further includes a processor and a memory, said memory containing instructions executable by said processor.

61. The Samsung 5G Access Unit further provides that the access point is operative to receive, from a user equipment (UE) wirelessly connected to the access point, a packet data unit (PDU), that is at least one of integrity protected and encrypted, as demonstrated in the exemplar text below:

Integrity protection of the RRC-signalling, and NAS-signalling is mandatory to use, except in the following cases:

All NAS signalling messages except those explicitly listed in TS 24.501 [35] as exceptions shall be integrity-protected.

All RRC signalling messages except those explicitly listed in TS 38.331 [22] as exceptions shall be integrity-protected with an integrity protection algorithm different from NIA0, except for unauthenticated emergency calls.

62. The Samsung 5G Access Unit further provides that the access point is operative to detect a type of the received PDU as a signaling radio bearer type or a data radio bearer type. The Samsung 5G Access Unit exchanges PDUs with the vRAN at the level of PDCP, i.e. PDCP PDUs.

Upon information and belief, the Samsung 5G Access Unit identifies different types of bearers from a UE and will include information indicating the bearer type (SRB or DRB) in communications to the vRAN containing the PDCP layer.

63. The Samsung 5G Access Unit further provides that the access point is operative to encapsulate the received PDU, that is at least one of integrity protected and encrypted, by setting a header to the PDU, which header comprises an identity indicating the detected type of PDU as the signaling radio bearer type or the data radio bearer type, and an identity indicating at least one of a source address and a destination address of the PDU, as demonstrated in the exemplar image below:

4.2.2 PDCP entities

The PDCP entities are located in the PDCP sublayer. Several PDCP entities may be defined for a UE. Each PDCP entity carrying user plane data may be configured to use either uplink data compression (UDC) or to use header compression.

Each PDCP entity is carrying the data of one radio bearer. In this version of the specification, the robust header compression protocol (ROHC) and UDC, are supported. Every PDCP entity uses at most one ROHC or one UDC compressor instance and at most one ROHC or UDC decompressor instance. ROHC and UDC are not supported simultaneously for the same radio bearer.

A PDCP entity is associated either to the control plane or the user plane depending on which radio bearer it is carrying data for.

[4] Page 34:

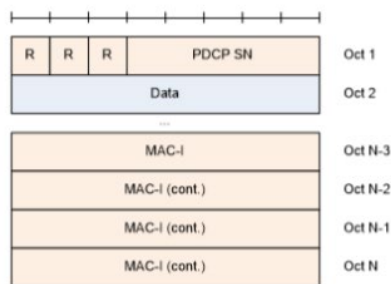


Figure 6.2.2.1: PDCP Data PDU format for SRBs

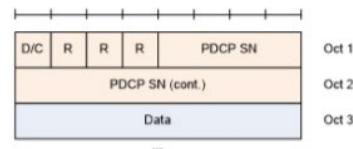


Figure 6.2.3.1: PDCP Data PDU format for DRBs using a 12 bit SN (for downlink)

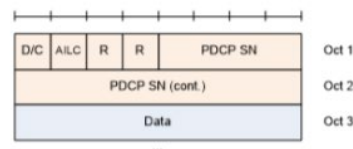


Figure 6.2.3.2: PDCP Data PDU format for DRBs using a 12 bit SN (for uplink)

64. The Samsung 5G Access Unit further provides that the access point is operative to send the encapsulated PDU to the wire line network node via the wire line, wherein a connection via the wire line is operative to identify the access point to the wire line network node, for further uplink transfer of the PDU based on the type of the PDU. The Samsung 5G Access Unit sends the PDUs via the protocols established between itself and the Samsung vRAN, which then forwards PDUs received from the Samsung 5G Access Unit, as demonstrated in the exemplar image in paragraph 59 above.

Count V: Claim for Patent Infringement of the '682 Patent

65. Ericsson repeats and realleges the allegations in paragraphs 1-64 as if fully set forth herein.

66. Samsung has infringed, contributed to the infringement of, and/or induced infringement of the '682 patent by making, using, selling, offering for sale, or importing into the United States, or by intending that others make, use, import into, offer for sale, or sell in the United States, products and/or methods covered by one or more claims of the '682 Patent including, but not limited to, cellular network infrastructure equipment and components thereof. The accused network equipment that infringes one or more claims of the '682 patent includes at least the Samsung eNB (LTE).

67. For example, at least the Samsung eNB (LTE) infringes at least claims 1, 15, 17 and 25 of the '682 patent. Samsung makes, uses, sells, offers for sale, imports, exports, supplies or distributes within the United States this network equipment and thus directly infringes the '682 patent.

68. Samsung indirectly infringes the '682 patent as provided by 35 U.S.C. § 271(b) by inducing infringement by others, such as resellers and end-user customers in this District and throughout the United States. For example, direct infringement is the result of activities performed by manufacturers, resellers, or operators/carriers of the Samsung eNB (LTE), who perform each step of the claimed invention as directed by Samsung. Samsung received actual notice of the '682 patent at least as early as the filing of this Complaint.

69. Samsung's affirmative acts of selling the Samsung eNB (LTE), causing the Samsung eNB (LTE) to be manufactured, and providing directions, instructions, schematics, diagrams, or designs to its manufacturers, resellers, or operators/carriers to make or use the Samsung eNB (LTE) in a manner that directly infringes the '682 patent induce infringement by others, such as resellers or operators/carriers in this District and throughout the United States. Through its manufacture and sales of the Samsung eNB (LTE), Samsung performed the acts that constitute induced infringement with knowledge or willful blindness that the induced acts would constitute infringement.

70. Samsung also indirectly infringes the '682 patent by contributing to infringement by others, such as resellers and operators/carriers, in accordance with 35 U.S.C. § 271(c) in this District and throughout the United States. Direct infringement is the result of activities performed by resellers, or operators/carriers of the Samsung eNB (LTE).

71. Samsung's affirmative acts of selling the Samsung eNB (LTE) and causing the Samsung eNB (LTE) to be manufactured and sold contribute to Samsung's manufacturers, resellers, and operators/carriers making or using the Samsung eNB (LTE) in a normal and customary way that infringes the '682 patent. The Samsung eNB (LTE) constitutes the material

part of Ericsson's patented invention, has no substantial non-infringing uses, and is known by Samsung to be especially made or especially adapted for use to infringe the '682 patent.

72. The Samsung eNB (LTE) includes an Automated Neighbor Relations feature, which provides a method, performed by a first network node, for handling handover failures for a target cell, the target cell being applicable for handover of a wireless device in a wireless communications network from a source cell to the target cell, as demonstrated in the exemplar text below:

LTE-S00201, Intra-LTE ANR

INTRODUCTION

Samsung automatic neighbor relation (ANR) automatically configures and manages the intra-LTE neighbor relation table (NRT), and it aims to maintain the optimal NRT reflecting changes in the communication environment during the system operation. Stable UE mobility of Samsung LTE cells is guaranteed by optimized NRT management. UE mobility is guaranteed as follows according to UE connection status.

- RRC_CONNECTED: Guarantees stable intra-LTE HO of the UE while connected to the cell.

73. The Samsung eNB (LTE) includes an Automated Neighbor Relations feature that determines an amount of failed handovers from the source cell to the target cell, comparing the amount of failed handovers to a failure threshold, as demonstrated in the exemplar text below:

The operator can control this function's ON/OFF state, and at the NR ranking calculation point k, the serving cell removes the NR i from the NRT or manages it as HO blacklist which meets the following conditions.

- 1 ANR_ENABLE = Auto or Manual &
- 2 WRONG_NR_DEL_FLAG = True &
 - oWRONG_NR_DEL_FLAG: ON/OFF control flag that determines the operational status.
- 3 ANR_ALLOW = True for the carrier in which NR i is operating
- 4 CumulatedNHoPrepSuc_i(k) ≥ TH_HO_PREP_SUCC_NR_DEL &
 - oCumulatedNHoPrepSuc_i(k): The number of HO preparation successes collected for NR i during TH_TIME_NR_DEL at the NR ranking calculation point k.
 - oTH_HO_PREP_SUCC_NR_DEL: The threshold value of HO attempts to decide HO performance degradation causing NR.
- 5 $\frac{\text{CumulatedNHOSuc}_i(k)}{\text{CumulatedNHoPrepSuc}_i(k)} \times 100 \leq \text{TH_HO_SUC_RATE_NR_DEL}$ &
 - oCumulatedNHOSuc_i(k): The number of HO success collected for NR i during TH_TIME_NR_DEL period at the NR ranking calculation point k.
 - oTH_HO_SUC_RATE_NR_DEL: The threshold value of the HO success rate to decide HO performance degradation causing NR.
- 6 IS_REMOVE_ALLOWED = True for NR i

74. The Samsung eNB (LTE) includes an Automated Neighbor Relations feature that, in response to the amount of failed handovers from the source cell to the target cell exceeding the failure threshold, associates the target cell with an indication indicating that the target cell is unsuitable for handover, as demonstrated in the exemplar text below:

5) Management of invalid NR

- Determination of invalid NR which causes HO preparation failure
 - a. Serving cell removes the invalid NR from the NRT or manages it as HO blacklist if the number of successive HO preparation failures is larger than the predefined threshold. The threshold can be configured by operator for each HO preparation failure cause.
 - oIn order to use this function, following parameter configuration is required.
 - ◆ANR_ENABLE = Auto or Manual
 - ◆NBR_DEL_CAUSE_FLAG = True
 - ◆Threshold > 0 per Cause

The following table shows S1 HO preparation failure causes.

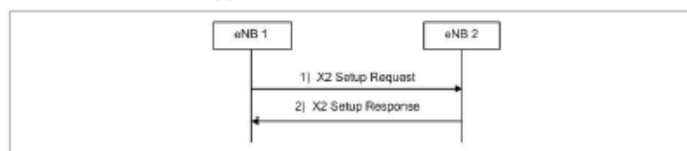
Causes	Meaning
Handover Failure In Target EPC/eNB Or Target System	The handover failed due to a failure in target EPC/eNB or target system.
TS1RELOCprep Expiry	Handover Preparation procedure is cancelled when timer TS1RELOCprep expires.
Cell not available	The concerned cell is not available.
Unknown Target ID	Handover rejected because the target ID is not known to the EPC.
Unknown PLMN	The MME does not identify any PLMN provided by the eNB.

75. The Samsung eNB (LTE) includes an Automated Neighbor Relation and an X2 Interface Management where a second network node receives, from a first network node serving the source cell, information about the target cell being associated with an indication that indicates that the target cell is unsuitable for handover, as demonstrated in the exemplar text below:

FEATURE DESCRIPTION

X2 AP Setup

X2AP setup procedure is for setting up the X2 interface between two eNBs for the first time. Assuming that eNB 1 triggers X2 setup, the following figure shows the X2 AP setup procedures for successful case.



- 1 The eNB 1 sends its global eNB ID, served cell information, neighbor information, MultibandInfoList, and GU group ID list information to eNB 2 using the X2 Setup Request message. (In the perspective of HeNB, eNB 1 shall contain the CSG ID IE in the X2 SETUP REQUEST message for each CSG or hybrid cell)
- 2 The eNB 2 receives the X2 Setup Request message and stores the information contained in it in appropriate locations. Then eNB 2 sends its global eNB ID, served cell information, neighbor information, and GU group ID list information to eNB 1 using the X2 Setup Response message. (In the perspective of HeNB, eNB 2 shall contain the CSG ID IE in the X2 SETUP RESPONSE message for each CSG cell or hybrid cell. The eNB receiving the IE shall take this information into account when further deciding whether X2 handover between the source cell and target cell may be performed.)

76. The Samsung eNB (LTE) includes an Automated Neighbor Relation and a PCI AutoConfiguration that monitors for a problem associated with at least some of the failed handovers and/or the subsequent failed handovers as demonstrated in the exemplar text below:

LTE-S00301, PCI AutoConfiguration

INTRODUCTION

The Samsung Physical-layer Cell Identity (PCI) optimization provides functions such as auto PCI configuration for initial PCI allocation during network installation, PCI collision, confusion detection, and auto PCI optimization for PCI reallocation.

There are 504 PCIs in the LTE system. PCIs consist of 168 unique physical layer cell identity groups, $N_{\{ID\}^{(1)}}$ and three physical layer identities within the physical layer cell identity group, $N_{\{ID\}^{(2)}}$. It is configured based on this formula:

$$N_{\{ID\}^{Cell}} = 3 * N_{\{ID\}^{(1)}} + N_{\{ID\}^{(2)}} \dots \dots \dots (1)$$

Where:

- $N_{\{ID\}^{(2)}}$ is related to cell-specific reference signal location pattern.
- $N_{\{ID\}^{(1)}}$ is a sequence number which is used $N_{\{ID\}^{Cell}}$ with $N_{\{ID\}^{(2)}}$

PCIs are used in synchronization and reference signal generation, which are involved in cell selection, handover and channel estimation procedures.

According to 3GPP specification there are 504 unique physical-layer cell identities. The physical-layer cell identities are put together into 168 unique physical-layer cell-identity groups, and each group contain three unique identities.

The Samsung PCI optimization policy is as follows:

- PCI allocated should satisfy the collision-free and confusion-free condition.
- PCI allocated should reduce inter-RS (cell-specific reference signal) interference.
- PCI of the cell with higher E-UTRAN Cell Identity (ECI) is changed, if PCI conflict is detected by X2 message.
- PCI of the cell reporting PCI collision is changed, if PCI collision is detected by RRC Connection Re-establishment Request message.

BENEFIT

- You can reduce CAPEX/OPEX required for network installation and expansion.
- This feature guarantees improved mobility between cells to end-users.

DEPENDENCY

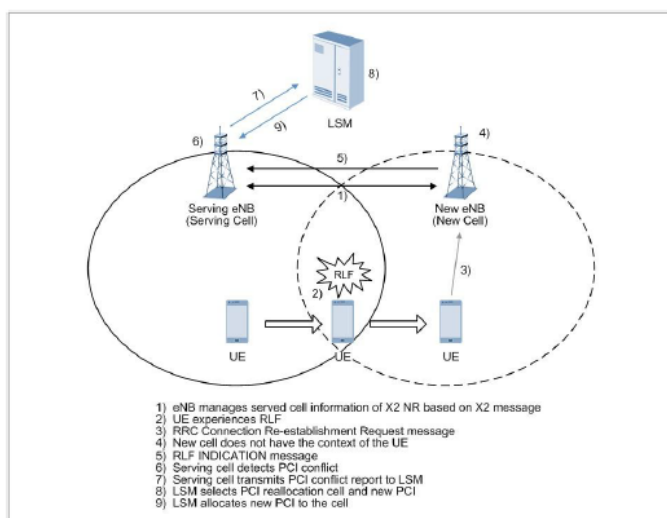
- Interface & Protocols

77. The Samsung eNB (LTE) includes an Automated Neighbor Relation and a PCI AutoConfiguration that monitors for a solution event indicating that the problem is resolved as demonstrated in the exemplar text below:

•PCI collision/confusion Detection Function

- Detects PCI collision/confusion using the X2 SETUP REQUEST, X2 SETUP RESPONSE, eNB CONFIGURATION UPDATE, and RLF INDICATION messages received from the call processor.
- Detects a PCI collision/confusion using the ECGI information received from the neighbor detection function.

78. The Samsung eNB (LTE) includes an Automated Neighbor Relation and a PCI AutoConfiguration that informs the first network node about the solution event as demonstrated in the exemplar text below:



PCI Reallocation Cell Selection

Because PCI conflict always happens in pair, PCI reallocation should change only one PCI.

When the EMS receives the PCI conflict report from the eNB, it determines one cell to change PCI based on ECI. The EMS selects the cell having higher ECI between two cells contained in the PCI conflict report. The EMS tries to change the PCI of the selected cell and instructs the cell with lower ECI to start the timer for triggering the request for a new PCI.

If the cell with a higher ECI successfully changes its PCI, then the eNB managing the cell sends its neighbor eNBs the X2 message which informs the change of the PCI. If the eNB managing the cell with a lower ECI receives this X2 message, the cell recognizes the resolution of the PCI conflict and then cancels the timer operation.

Otherwise, the timer will be expired and the cell with a lower ECI will recognize that the PCI conflict is not resolved. Then, the cell with a lower ECI requests the EMS to reallocate a new PCI.

If EMS receives UE mobility based PCI collision detection event, it selects the cell which reported PCI collision detection event as PCI reallocation cell.

Count VI: Claim for Patent Infringement of the '066 Patent

79. Ericsson repeats and realleges the allegations in paragraphs 1-78 as if fully set forth herein.

80. Samsung has infringed, contributed to the infringement of, and/or induced infringement of the '066 patent by making, using, selling, offering for sale, or importing into the United States, or by intending that others make, use, import into, offer for sale, or sell in the United States, products and/or methods covered by one or more claims of the '066 Patent including, but not limited to, cellular network infrastructure equipment and components thereof. The accused network equipment that infringes one or more claims of the '066 patent includes at least the Samsung 5G Access Unit (including, but not limited to, Samsung's SFG-AA100 and/or AT1K01 network components).

81. For example, at least the Samsung 5G Access Unit infringes at least claims 1, 13, and 15 of the '066 patent. Samsung makes, uses, sells, offers for sale, imports, exports, supplies or distributes within the United States this network equipment and thus directly infringes the '066 patent.

82. Samsung indirectly infringes the '066 patent as provided by 35 U.S.C. § 271(b) by inducing infringement by others, such as resellers and end-user customers in this District and throughout the United States. For example, direct infringement is the result of activities performed by manufacturers, resellers, or operators/carriers of the Samsung 5G Access Unit, who perform each step of the claimed invention as directed by Samsung. Samsung received actual notice of the '066 patent at least as early as the filing of this Complaint.

83. Samsung's affirmative acts of selling the Samsung 5G Access Unit, causing the 5G Access Unit to be manufactured, and providing directions, instructions, schematics, diagrams, or designs to its manufacturers, resellers, or operators/carriers to make or use the 5G Access Unit in a manner that directly infringes the '066 patent induce infringement by others, such as resellers or operators/carriers in this District and throughout the United States. Through its manufacture and sales of the Samsung 5G Access Unit, Samsung performed the acts that constitute induced infringement with knowledge or willful blindness that the induced acts would constitute infringement.

84. Samsung also indirectly infringes the '066 patent by contributing to infringement by others, such as resellers and operators/carriers, in accordance with 35 U.S.C. § 271(c) in this District and throughout the United States. Direct infringement is the result of activities performed by resellers, or operators/carriers of the Samsung 5G Access Unit.

85. Samsung's affirmative acts of selling the Samsung 5G Access Unit and causing it to be manufactured and sold contribute to Samsung's manufacturers, resellers, and operators/carriers making or using the 5G Access Unit in a normal and customary way that infringes the '066 patent. The Samsung 5G Access Unit constitutes the material part of Ericsson's patented invention, has no substantial non-infringing uses, and is known by Samsung to be especially made or especially adapted for use to infringe the '066 patent.

86. The Samsung 5G Access Unit includes a network node for flexible bearer handling in a communications network.

87. Upon information and belief, the Samsung 5G Access Unit further includes a processor and a non-transitory computer-readable storage medium coupled to the processor with the computer-readable storage medium storing instructions.

88. The Samsung 5G Access Unit further provides that the processor causes the network node to acquire packet data convergence protocol (PDCP) protocol data units (PDUs). The Samsung 5G Access Unit sends and receives PDCP Protocol Data Units to and from the vRAN, as demonstrated in the exemplar image below:

The 5G FWAU utilises a Functional Split Option 2, which means that all real time protocols (PHY, MAC and RLC) are included in the unit together with the RF and antenna parts, whereas non-real time protocols, i.e. PDCP and RRC, adopt a virtualised approach in vRAN, as illustrated in Figure 7.

Samsung 5G vRAN VNF can run on various types of computing hardware, including COTS equipment.

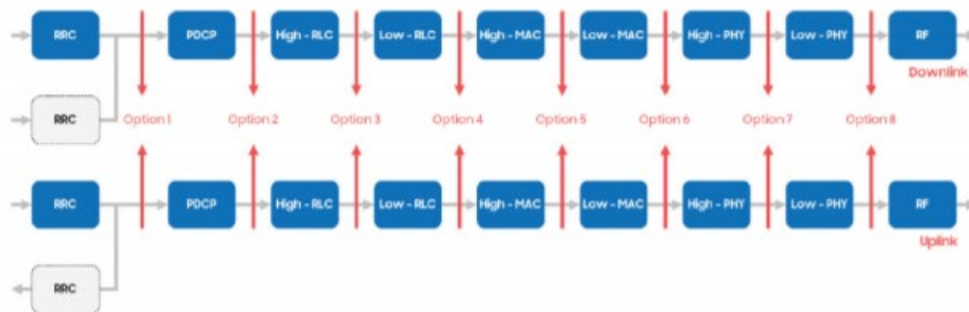


Figure 7 : Radio Access Functional Split

89. Upon information and belief, the Samsung 5G Access Unit further provides that the processor causes the network node to encapsulate individual PDCP PDUs into individual frames at a protocol layer that is at least one protocol layer above a bottom-most protocol layer.

90. The Samsung 5G Access Unit further provides that the encapsulating said individual PDCP PDUs into said individual frames comprises mapping logic channel flows to network addresses. The Samsung 5G Access unit includes a logical channel to connect the RLC

and PDCP entities for exchanging PDCP PDUs using network locations addressable via network addresses, as demonstrated in the exemplar image below:

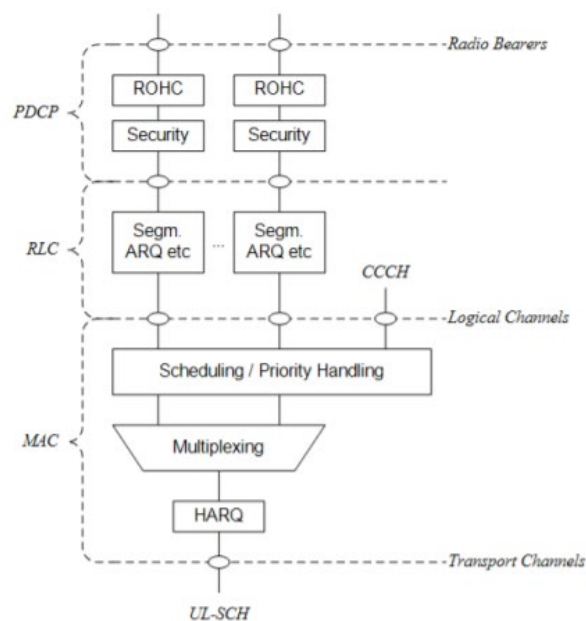


Figure 6-2: Layer 2 Structure for UL

91. The Samsung 5G Access Unit further provides that each frame of said individual frames comprises a first signal radio bearer (SRB1), a second signal radio bearer (SRB2), a data radio bearer (DRB) or a combination of different bearers, as demonstrated in the exemplar image in paragraph 63 above.

92. The Samsung 5G Access Unit further provides that the processor causes the network node to switch said individual frames towards a packet switched network, the switching based at least in part on identifying a type of PDCP PDU carried by each of said individual frames, as demonstrated in the exemplar image in paragraphs 59 and 63 above.

93. The Samsung 5G Access Unit further provides that the switching of said individual frames towards the packet switched network comprises: forwarding said individual frames

comprising the SRB1 to a radio resource control (RRC) acting-entity in the network; and forwarding said individual frames comprising the SRB2 to an S1-AP and non-access stratum (NAS) acting-entity in the network, as demonstrated in the exemplar images and text below:

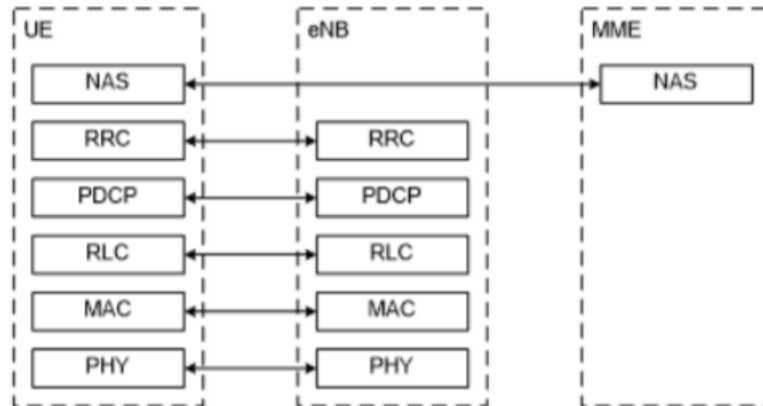


Figure 4.3.2-1: Control-plane protocol stack

19.2 S1 Control Plane

The S1 control plane interface (S1-MME) is defined between the eNB and the MME. The control plane protocol stack of the S1 interface is shown on Figure 19.2-1. The transport network layer is built on IP transport, similarly to the user plane but for the reliable transport of signalling messages SCTP is added on top of IP. The application layer signalling protocol is referred to as S1-AP (S1 Application Protocol).

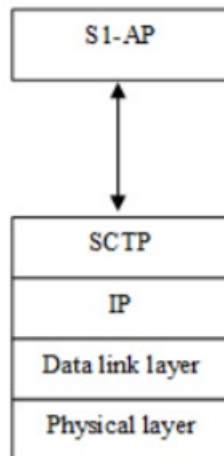


Figure 19.2-1: S1 Interface Control Plane (eNB-MME)

DEMAND FOR JURY TRIAL

94. Ericsson hereby demands a trial by jury on all claims so triable.

PRAYER FOR RELIEF

WHEREFORE, Ericsson respectfully requests that this Court enter judgment in its favor and grant the following relief:

- A. Adjudge that Samsung infringes the Asserted Patents;
- B. Adjudge that Samsung's infringement of the Asserted Patents was willful, and that Samsung's continued infringement of the Asserted Patents is willful;
- C. Award Ericsson damages in an amount adequate to compensate Ericsson for Samsung's infringement of the Asserted Patents, but in no event less than a reasonable royalty under 35 U.S.C. § 284;
- D. Award enhanced damages pursuant to 35 U.S.C. § 284;
- E. Award Ericsson pre-judgment and post-judgment interest to the full extent allowed under the law, as well as its costs;
- F. Enter an order finding that this is an exceptional case and awarding Ericsson its reasonable attorneys' fees pursuant to 35 U.S.C. § 285;
- G. Enter a permanent injunction against all Samsung products found to infringe the Asserted Patents;
- H. Award, in lieu of an injunction, a compulsory forward royalty;
- I. Order an accounting of damages; and
- J. Award such other relief as the Court may deem appropriate and just under the circumstances.

DATED: January 15, 2021

Respectfully submitted,

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